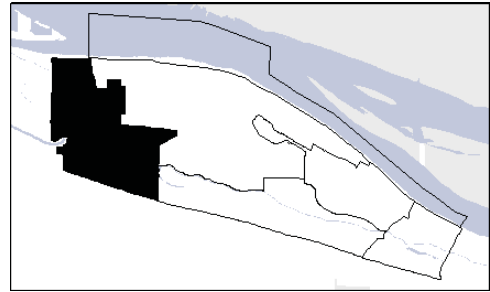


INVENTORY SITE CS1: Buffalo Slough/ Peninsula Canal

Summary Information

Watershed: Columbia Slough

Neighborhood: East Columbia, Sunderland, Woodlawn, Concordia, Cully



USGS quadrangle and quarter section maps: 1N1E01, 1N1E02, 1N1E11, 1N1E12, 1N1E13, 1N1E14, and 1N2E07

River Mile: 8.8-10.2 (beginning at the Multnomah County Drainage District levee that separates the Lower and Middle Columbia Slough to the confluence of Whitaker Slough and the Columbia Slough main channel)

Site Size: 1,287 acres

Previous Inventories: Inventory and Analysis of Wetlands, Water Bodies and Wildlife Habitat Areas for the Columbia Corridor: Industrial/Environmental Mapping Project (City of Portland January 1989)

Zoning: General Industrial 2 (IG2)
Open Space (OS)
Single Dwelling Residential (RF, R20 and R10)
Aircraft Landing height overlay (h)
Airport Noise overlay (x)
Environmental Conservation overlay (c)
Environmental Protection overlay (p)

Existing Land Use: industrial; golf courses; residential; natural area

General Description: This site includes part of the Middle Slough including Buffalo Slough, Peninsula Canal and portions of the main arm of the Columbia Slough. Multiple secondary drainageways are found in the site including Elrod Slough, which is an east-west channel that discharges to the Columbia Slough. Subaru Wetlands (approximately 43 acres) and Blue Heron Meadows wetland (approximately 4 acres) are also located within the site boundaries.

Resource Features: open water stream/drainageway channels; herbaceous, scrub-shrub and forested wetlands; vegetated flood area; bottomland hard wood forest; grass lands

Functional Values: microclimate and shade; stream flow moderation and water storage; bank function, and sediment, pollution and nutrient control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; wildlife habitat; habitat connectivity/ movement corridor

Special Habitat Area(s):

- CS11: Blue Heron Meadows Wetlands –wetland (W); bottomland hardwood forest (B); and migratory stopover habitat (M)
- CS12: Peninsula Drainage Canal – migratory stopover habitat (M); wildlife connectivity corridor (C); area vital to at risk species including Western painted turtles (S)
- CS13: Subaru Wetlands – wetland (W); bottomland hardwood forest (B).
- CS14: Buffalo Slough – wildlife connectivity corridor (C); resources or structure that provides unique habitat function in natural or built environment because it is an active groundwater upwelling area (U).

- *CS15: Buffalo Street Mitigation Site* – migratory stopover habitat (M); and wildlife connectivity corridor (C)
- *CS25: Columbia Edgewater Country Club* – migratory stopover habitat (M)
- *CS26: Elrod Slough Complex* – wildlife connectivity corridor (C) and wetland (W)
- *CS27: Riverside Golf Course* - area vital to at risk bat species (S); migratory stopover habitat (M)
- *CS28: Broadmoor Golf Course* - area vital to at risk bat species (S); migratory stopover habitat (M)
- *CS30: Middle Slough* – area vital to at risk species including Western painted turtle and Northern red-legged frog (S); migratory stopover habitat (M); and wildlife connectivity corridor (C)

Special Status Species:

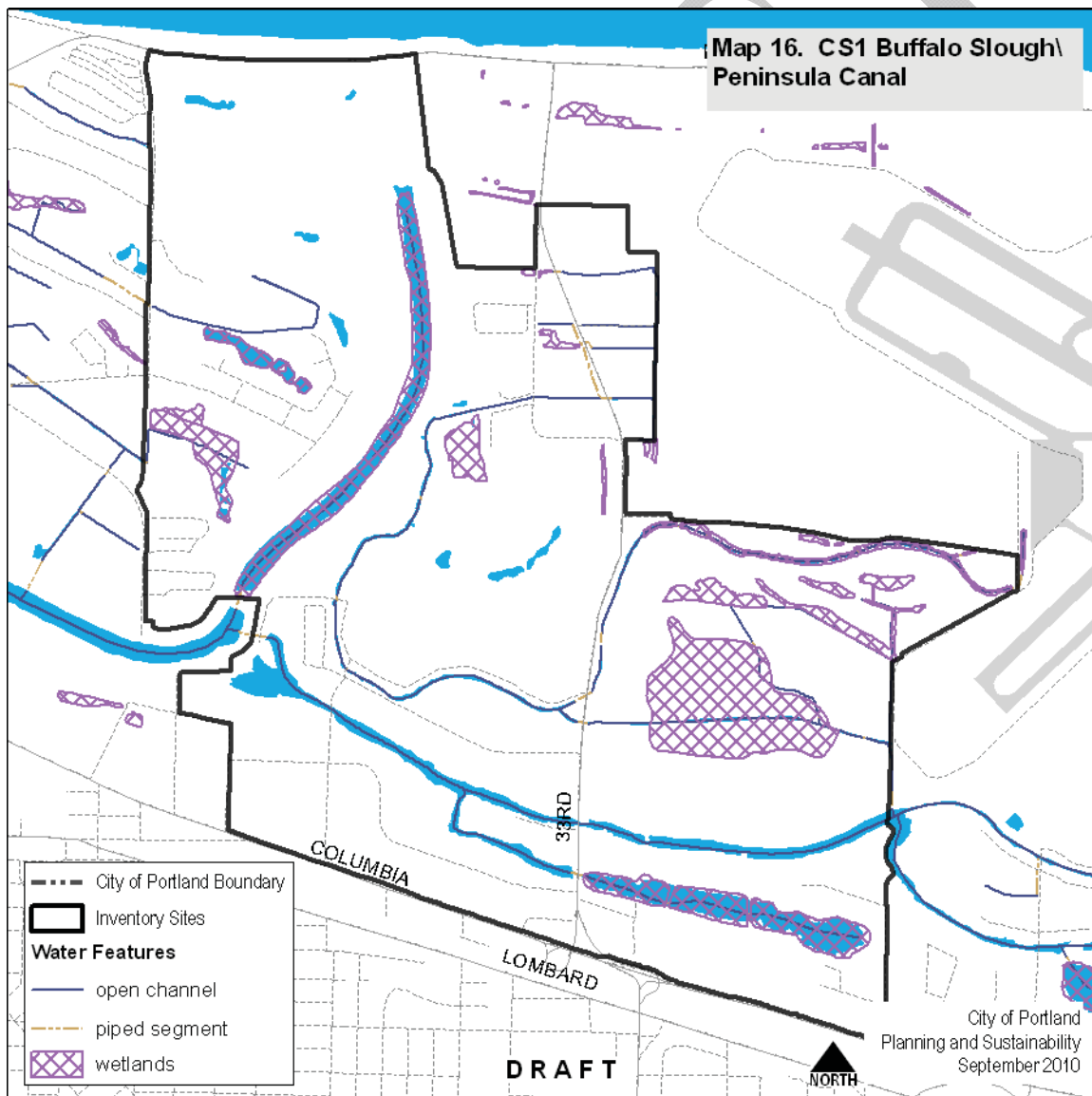
- *Birds:* American kestrel, bald eagle, band-tailed pigeon, bufflehead, bullock's oriole, bushtit, common yellowthroat, downy woodpecker, hooded merganser, great blue heron, house wren, loggerhead shrike, olive-sided flycatcher, peregrine falcon, purple martin, swainson's hawk, swainson's thrush, vaux's swift, western meadowlark, western wood peewee, white-breasted nuthatch, willow flycatcher, wood duck and yellow-rumped warbler
- *Mammals:* American beaver
- *Reptiles:* Western painted turtle, western pond turtle
- *Amphibians:* Northern red-legged frog, Western painted turtle

Natural Hazards: flood area

Contamination: Yes

Site Description

The Buffalo Slough/Peninsula inventory site is 1,287 acres in size. The site includes industrial land uses around the Columbia Slough including the Multnomah County Drainage District Headquarters; three golf courses (Broadmoor, Riverside and Columbia Edgewater); residential land uses west of Peninsula Canal and vacant lands. The site contains approximately 271 acres of impervious area, including 10.5 miles of roads. Site CS1 Map 1 shows an aerial view of the Buffalo Slough/Peninsula inventory site.



A roughly 1.5-mile long section of the Columbia Slough main arm, extending from the main cross levee to the confluence of Whitaker Slough, Buffalo Slough and Peninsula Canal, traverses this site. The site also contains 5.7 miles of secondary drainageways, including Elrod Slough, and 9 wetlands equaling 120 acres. The 341-acre flood area includes 74 acres of open water, 231 acres of vegetated flood area and 36 acres of non-vegetated flood area (CS1 Map 2). The Multnomah County Drainage District (MCDD) maintains the levees and water levels in the Columbia Slough to provide flood protection and stormwater conveyance. The management of the Columbia Slough waterways riparian reduces flooding and affects the riparian corridor functions. The inventory models have been adjusted to reflect a lesser level of function than assigned to more active flood areas in the rest of the City.

Vegetated areas at least $\frac{1}{2}$ acre include approximately 53 acres of forest or dense tree canopy, 207 acres of woodland, 53 acres of shrubland and 510 acres of herbaceous cover (CS1 Map 2).

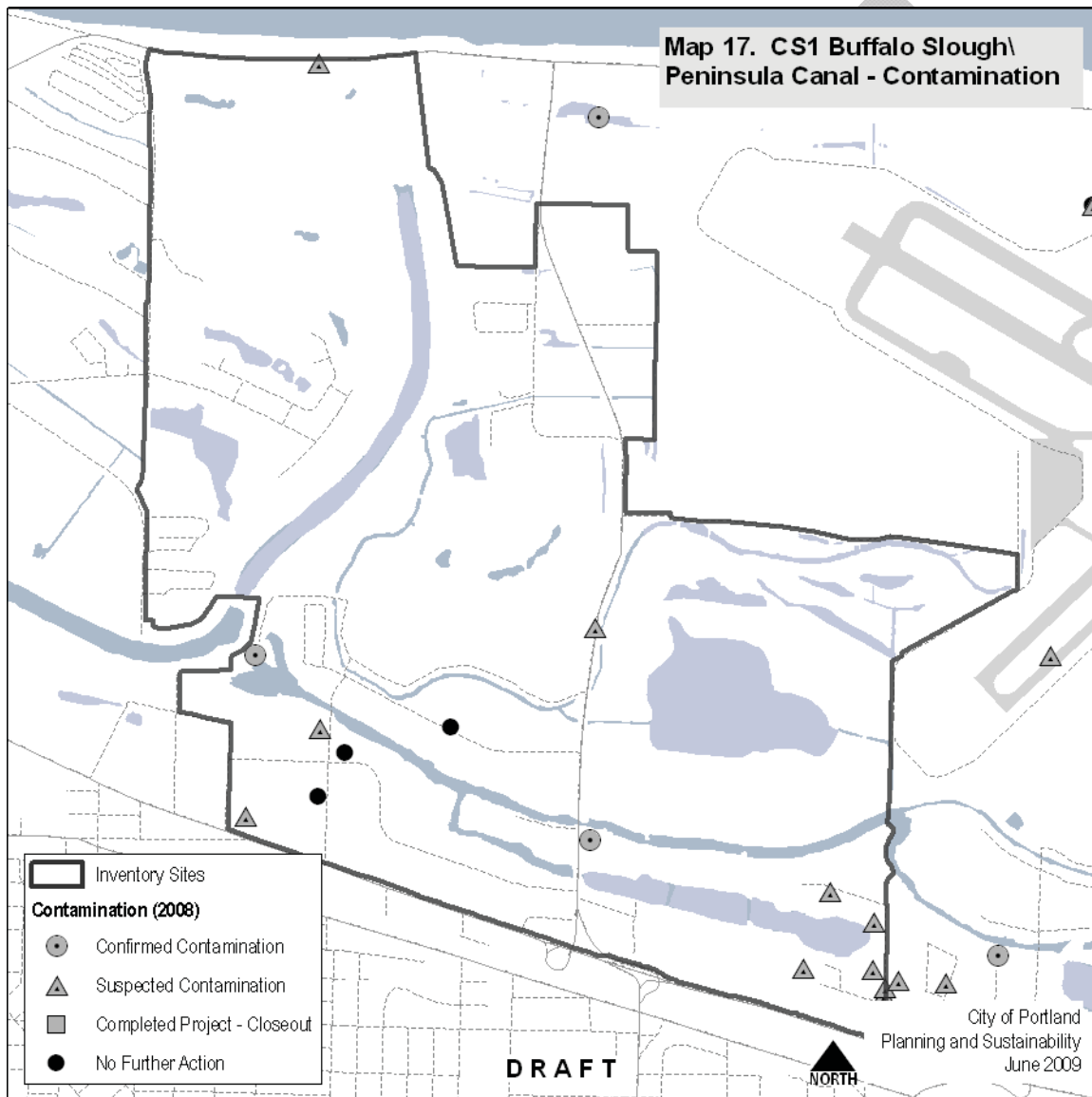
The City of Portland Bureau of Environmental Services (BES) has conducted revegetation projects throughout the site. There are currently eight active and nine completed sites, and one prospective revegetation site. Much of the revegetation has occurred in riparian areas around the Columbia Slough, Buffalo Slough, Elrod Slough, and associated with wetlands including Blue Heron Meadows and the Freightliner Wetland. BES, in partnership with the US Army Corps 1135 program, replaced two small vehicle bridges over Buffalo Slough to improve water quality and habitat. Under the same program BES is currently planning new bridge over Buffalo Slough at NE 33rd Ave.

There are also two Port of Portland mitigation sites located in this inventory site – Buffalo Street and Elrod Road mitigation sites.

Table 11: Summary of Natural Resource Features in CS1: Buffalo Slough/Peninsula Canal

Study Area (1,287 acres)	
Stream/Drainageway (miles)	9
Wetlands (acres)	120
Flood Area (acres)*	341
Vegetated (acres)	231
Non-vegetated (acres)	36
Open Water** (acres)	74
Vegetated Areas $\geq \frac{1}{2}$ acre (acres)⁺	823
Forest (acres)	52
Woodland (acres)	207
Shrubland (acres)	53
Herbaceous (acres)	510
Impervious Surfaces (acres)	271
* The flood area includes the FEMA 100-year floodplain plus the adjusted 1996 flood inundation area. ** Open Water includes portions of the Columbia Slough, Buffalo Slough and Peninsula Canal within the site. ⁺ The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy. The data within the primary study area and within 300 feet of all open water bodies in Portland is draft and is currently being updated based 2008 aerial photography.	

The Oregon Department of Environmental Quality (DEQ) has identified confirmed and suspected contaminated areas within the site (Map 17). Soil, groundwater and surface water within the site contain contamination resulting from past and current activities. Historic industrial uses, combined sewer overflows and agricultural runoff may have contributed over the past 50 years to contamination. More current contamination is the result of used motor oil spills, abandoned drums and other industrial uses. Types of pollutants found in the site included ethylbenzene, toluene, TPH, xylenes, cyanide sludge and metals. Potential environmental and health risks include recreational exposure and fish consumption. Ingestions of sediment, water and organisms may post a threat to wildlife, aquatic and pelagic organisms. Bioaccumulation may post a particular risk to animals at the top of the food chain. For more information regarding contamination, visit the DEQ website at <http://www.deq.state.or.us/lq/ecsi/ecsi.htm>.



Natural Resource Description

The natural resources are described for sub areas of the inventory site (see Map 18).



Middle Columbia Slough

The site contains approximately 3.5 miles of the Columbia Slough main channel, referred to here as the Middle Slough. The portion of the Middle Slough within the site is characterized by a low gradient channel and extensive macrophyte growth that impacts flow and water quality. The riparian area adjacent to the Middle Slough is generally one to two trees in width. These areas are generally bottomland hardwood forest comprised of black cottonwood and red alder. Other native vegetation species present include Douglas-fir, western red cedar, snowberry, red-flowering currant, red-osier dogwood, Indian plum, Oregon grape, Nootka and swamp rose, and vine maple. Invasive plant species found throughout in the riparian area include Himalayan blackberry, Japanese knotweed and reed canary grass.

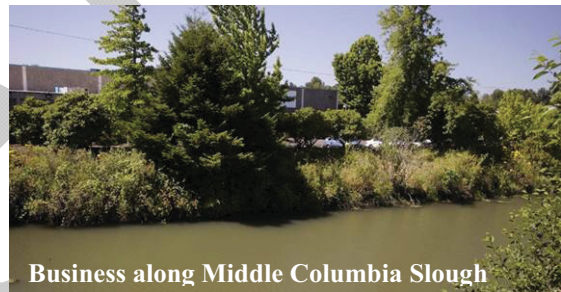


Paddlers in the Middle Columbia Slough

The Middle Slough and associated waterways are completely surrounded by levees and are contained within MCDD. As a result, the water can reach the Lower Slough only if pumped or allowed to flow through the MCDD levee gravity gates that separate the Middle and Lower Columbia Slough. In an average year, MCDD allows Middle Slough water to flow through the floodgates into the Lower Slough by gravity for only a few weeks (generally late fall to early winter). During the other months, or when water levels in the Lower Slough are higher than those in the Middle Slough, water must be pumped against the gradient. Pump Station No. 1 has a pumping capacity of 250,000 gallons per minute (gpm).

The width of the Middle Slough waterway varies in general from 30-100 feet. A section just upstream of MCDD Pump Station No. 1 (where the Vanport Flood broke the levee and gouged out the channel) was 90 feet deep after the 1948 flood, but now is approximately 10 to 16 feet deep. The average channel depth in the Middle Slough ranges from 6 to 8 feet NGVD (CH2M Hill 1995). Estimates of groundwater inflow in the Slough vary from 50 to 100 cubic feet per second (cfs).

The Columbia Slough is water quality limited for multiple parameters including bacteria, temperature, dissolved oxygen and biochemical oxygen demand (BOD), eutrophication (phosphorus, chlorophyll a, pH), heavy metals and total suspended solids. In general, the Middle Slough has better water quality than the Upper and Lower Slough. Water temperatures are generally cooler in the Middle Slough, due in large part to cool groundwater inputs. Macrophyte and algae growth is extensive in the Middle Slough. This is a result of slow flows, solar access (lack of shading) and high concentration of nutrients. Macrophytes and algae produce oxygen during the day but at night they respire using oxygen and producing carbon dioxide. This can result in the dissolved oxygen concentration and pH becoming low during the morning hours and creating inhospitable conditions for some species of fish, amphibians and macroinvertebrates.



Business along Middle Columbia Slough

The Middle Slough provides habitat for numerous native fish and wildlife species including:

- Fish – three-spined stickleback, largescale sucker
- Mussels – Oregon floater, California floater, winged floater
- Amphibians – Northern red-legged frog, Northwest Salamander, Long-toed Salamander
- Reptiles – Western painted turtle
- Birds – Great blue heron, green heron, wood duck, American wigeon, hooded merganser, common merganser, green-winged teal, belted kingfisher, Vaux's swift, violet green swallow, tree swallow, Willow flycatchers
- Mammals – Yuma myotis, long-legged myotis, long-eared myotis, silver-haired bat, hoary bat, muskrat, Northern river otter, American beaver

Habitat in the Middle Slough is affected by nearby development. Industrial development, including buildings, loading areas and parking lots, encroach into the riparian area fragmenting habitat and reducing shade potential from riparian vegetation. Cornfoot Road, north of the Middle Slough between NE 47th Avenue and Alderwood Road, is in close proximity (between 25 and 100 feet) of the waterway and impacts riparian vegetation, wildlife habitat and water quality.

The Middle Slough has been designated Special Habitat Area CS30 because it meets the S criteria by providing important habitat for at risk species, including Western painted turtle and Northern red-legged frog. The riparian corridor provides migratory stopover (M) habitat for birds and bats, some of which are also listed as at risk by the City (S) including Willow flycatcher, silver-haired bat and others. Both the waterway and the riparian area are a wildlife connectivity corridor (C), providing wildlife an opportunity to move between other important habitat areas including Johnson Lake, Whitaker Slough, Whitaker Ponds and Buffalo Slough.

Buffalo Slough

Buffalo Slough is a one-mile southern arm of the Columbia Slough in the vicinity of NE 33rd Drive. The western portion of Buffalo Slough is surrounded by industrial development and has a narrow area of riparian vegetation. The middle of Buffalo Slough is bordered by the Broadmoor Golf Course, there is industrial development to the east and south and a Port of Portland mitigation site to the north.

The Buffalo Slough, like much of the Columbia Slough, is a low gradient channel. The primary sources of flow in Buffalo Slough are groundwater from the south and stormwater outfalls; there are no tributaries to Buffalo Slough. The flow is influenced by the culvert at NE 33rd Drive, which can impound flow. The low gradient nature of the slough, the crossings and relative lack of shading can cause water to become stagnant, especially in the summer, resulting in warm water temperatures, algae and macrophyte growth, and reduced dissolved oxygen concentrations.

During a summer 1996 survey of aquatic macroinvertebrates in Buffalo Slough by Parametrix, Inc., the most dominant species found were Chironomid midges, ostracods, and oligochaete worms. Amphipoda (scuds-crustacea), Copepoda (microcrustaceans), Cladocera (microcrustaceans), and Corixidae (water boatmen) were also found. The preliminary conclusion from this analysis was that limited diversity of the benthic community is most likely due to low levels of dissolved oxygen (Wisseman, 2001).



Sediment testing was performed in Buffalo Slough to test for risks associated with contamination. The most commonly found sediment contaminants included heavy metals (lead, zinc, chromium, copper) and toxic organic chemicals (pesticides and PCBs). Many of the toxic organic chemicals have been banned for many years, so these chemicals could have been washed into the Slough years ago or have recently been introduced into sediments from “legacy” sources. Legacy sources are upland sources that may become disturbed during construction activities. Contaminant levels were found to be fairly low and uniform throughout the entire Columbia Slough. Sediment toxicity assays performed on sediments from Buffalo Slough did not show toxicity to benthic organisms (e.g. insects that live in the sediment). However, studies show a potential risk to humans who consume fish caught in Buffalo Slough due to bioaccumulation of toxic organic chemicals.

The vegetated riparian area around Buffalo Slough is very narrow, except at the Port of Portland Buffalo Street Mitigation Site.

West of NE 33rd Drive, the riparian area consists of a strip of trees one to two trees deep, predominantly comprised of black cottonwood, with an understory of Himalayan blackberry and English holly. English ivy is also locally present, but mostly as a ground cover—very little has begun to climb into the trees. Along the south bank is a shrubland vegetation type containing a wide range of woody species, many of which are young trees (less than 15 feet). Black cottonwood, pin oak, and willow (spp.) have the largest representation. Other species include: paper birch, black locust, English laurel, butterfly bush, Scots broom, and Himalayan blackberry. There is very little ground cover present.

Along the west edge of NE 33rd Drive, north of the riparian forest, is an area of grass-covered lawn largely fronted by English laurels and a few other ornamental shrubs. East of NE 33rd Drive, the tree canopy is less dense but contains similar vegetation as that to the west: black cottonwood with a Himalayan blackberry understory. At the golf course, the vegetation is primarily maintained turf grasses.

During a site visit in spring 2009 the following birds were observed using Buffalo Slough and surrounding vegetation: American robin, marsh wren, redwing blackbird, Oregon junco, song sparrow, Anna's hummingbird, mourning dove, mallard, ringneck duck, and American widgeon. Two nutria were also seen swimming across the slough.

The Buffalo Slough is designated Special Habitat Area CS14.A and B because it is an active groundwater upwelling area (U) and it provides a wildlife connectivity corridor between other important habitat areas including the Middle Slough and Buffalo Street Mitigation Site (C).

The Port of Portland Buffalo Street Mitigation Site is located between the eastern end of Buffalo Slough and Columbia Slough. In 1994 the Port planted the site with native vegetation. Trees include Oregon ash, black cottonwood, Oregon white oak and Western red cedar. Shrubs included red osier dogwood, Douglas spirea, red alder, black hawthorn, oceanspray, and willow. Ground covers included yarrow, aster, red columbine, slough sedge, rushes and fescues. Since 1994, the site has been managed to reduce invasive species and establish the plantings. Today the site has areas of woodland habitat, open grasses, meadows and wetland. Portions of the uplands provide refugia for amphibian and reptiles. Table 12 is a list of fish and wildlife species observed by Port of Portland staff between 2001 and 2008.



Buffalo Street Mitigation Site

The Port of Portland Buffalo Street Mitigation Site has been designated a Special Habitat Area (CS14) because it meets multiple criteria. The area provides migratory stopover habitat for avian species (M) and it is a wildlife connectivity corridor between Buffalo Slough and the Middle Slough (C).

Table 12: Port of Portland Fish and Wildlife Species Observations in Buffalo Slough Site 2001-2008

Birds		
Accipiter, unidentified	*Eurasian wigeon	*Ring-necked duck
American crow	European starling	Red-breasted sapsucker
American goldfinch	Flycatcher, unidentified	Red-tailed hawk
American kestrel	Gadwall	Red-winged blackbird
American robin	Golden-crowned sparrow	Ruby-crowned kinglet
*American wigeon	Great blue heron	Shrew
Ash-throated flycatcher	Great egret	Song sparrow
Bald eagle	Green-winged teal	Spotted towhee
Band-tailed pigeon	Gull, unidentified	Stellar jay
Barn owl	*Hooded merganser	Swainson's thrush
Barn swallow	House finch	Swallow, unidentified
*Belted kingfisher	House wren	Thrush, unidentified
Bewick's wren	Hummingbird, unidentified	Tree swallow
Brown-headed cowbird	Killdeer	Turkey vulture
*Bufflehead	Lazuli bunting	Vaux's swift
Bullock's oriole	*Mallard	Violet-green swallow
Bushtit	Marsh wren	Warbling vireo
*Cackling goose	Mourning dove	Western scrub jay
*Canada goose	Muskrat	Western wood peewee
*Canvasback	Northern flicker	Willow flycatcher
Cedar waxwing	*Northern shoveler	Wilson snipe
*Common merganser	Nuthatch	Wood duck
Common yellowthroat	Nutria	Yellow-rumped warbler
Dark-eyed junco	Osprey	
*Double-crested cormorant	Peregrine falcon	
Downy woodpecker	* Pied-billed grebe	
Mammals		
Beaver	Deer	River otter
Black-capped chickadee	Mole	Squirrel
Cottontail rabbit	Opposum	Vole
Coyote	Raccoon	
Reptiles and Amphibians		
Garter snake	Pacific treefrog	
Fish		
*Carp		

*Observed in adjacent open-water habitat

Peninsula Drainage Canal

Peninsula Drainage Canal is a roughly 1.5 mile long isolated slough segment. Peninsula Drainage Canal was originally created by the Corps of Engineers in 1921 in an attempt to improve water quality in the Lower Columbia Slough by flushing it with flows from the Columbia River. However, this effort did not succeed because the tidal effect and low gradient of the Lower Slough did not allow enough additional Columbia River flow to improve water quality. Furthermore, the opening to the Columbia River silted in quickly. In 1948, instead of reinforcing the canal levee, the ends of the canal were plugged. Today the Peninsula Drainage Canal acts as a closed system, bound on all sides by levees. Until 1999/2000 the canal was used as watering for livestock resulting in soil compaction and erosion.

**Peninsula Drainage Canal**

The forested area along the northwest bank of the canal is a high quality black cottonwood forest with a Pacific willow and red-osier dogwood understory. Several snags are present and there is some large wood in the channel. An emergent bench exists below the wooded strip including scouring rush and young ash trees. The southwestern bank of the canal is occupied by an open cottonwood forest. Some large snags are present here as well. The understory contains red-osier dogwood, Himalayan blackberry, as well as some English ivy and reed canary grass. The east side of the canal is almost completely reed canary grass with a few swamp roses.

Peninsula Drainage Canal supports one of two known significant populations of Western painted turtles within the Columbia Slough Watershed in the City of Portland. The area also provides habitat for kingfisher and wind shelter for waterfowl off the Columbia River. Avian species known to utilize the site: American wigeon, Anna's humming bird, bald eagle, cackling goose, common merganser, Eurasian wigeon, greater white-fronted goose, green-winged teal, loggerhead shrike, northern flicker, northern pintail, northern shoveler, olive-sided flycatcher, purple martin, red-tailed hawk, ringneck duck, raven's goose, swainson's hawk, tree swallow, western meadowlark, willow flycatcher and white-breasted nuthatch. Extensive signs of beaver have been observed. Western painted turtle, western pond turtle and northern red-legged frog have been documented by ODFW using the canal, as well as bull frog and carp.

Peninsula Drainage Canal is designated as a Special Habitat Area (CS13) because it provides habitat for migratory avian species (M); important habitat for Western Painted turtle, which is an at risk species (S); and is a wildlife connectivity corridor between the Columbia Slough and Columbia River (C).

Sediment testing performed in the Peninsula Drainage Canal found risk marginally above acceptable levels for human health. In December 2002, DEQ issued a conditional "no further action" letter for the canal however, long-term monitoring of this site is necessary.

Blue Heron Meadows

Until 1999, this area was primarily used for agriculture including row-crop fields and pastures. High winter/spring groundwater formed standing open water areas used by large numbers of migrating and wintering waterfowl and shorebirds for resting, feeding, staging and courtship.

In 1999/2000 much of the agricultural uses ended and residential development began around the wetlands. Blue Heron Meadows wetland was established as an open space tract. Stormwater from the residential development is treated in bioswales and then discharged to the wetland.



The eastern side of the wetland is woodland consisting black cottonwood/red alder and shrubland containing red-osier dogwood, Douglas spiraea, willow, cattails, and common rush. Areas identified as shrubland contain a mixture of species including Douglas spiraea, red-osier dogwood, and willow. Several species of wetland emergents are found around the pond edges.

Along the north and west of the wetland complex is heavily vegetated woodland with black cottonwood, red alder, and Oregon ash. Primary understory components were red-osier dogwood and reed canary grass with Himalayan blackberry along the south side of the drainage channel continuing all the way to NE 13th Ave. and spreading into the open shrubland to the west. Several species of wetland emergents are found around the pond edges.



Stormwater Swale

The large field that encompasses the northern half of the survey site is still used for agricultural purposes. Portions of this field are seasonally covered with shallow standing water. The herbaceous area in the southwest is a grassy pasture and the area within the pond complex is a combination of reed canary grass with a native grass mix that was seeded when the water quality ponds were created.

In April 2009, tree frogs and red-winged blackbirds were heard around the ponds, and mallards and Canada geese were observed on site. Deer tracks were also observed and residents confirmed that a group of five deer regularly use the site along with garter snakes, nutria, and coyotes.

Blue Heron Meadows wetland is designated as a Special Habitat Area (CS11) because it is a remnant wetland with associated bottomland hardwood forest vegetation (W, B); and it provides migratory stopover habitat for avian species (M).

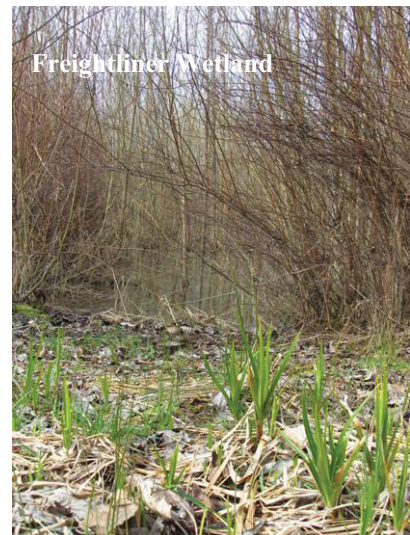
Freightliner Wetlands

To the south of Blue Heron Meadows wetland is a wetland, a secondary drainageway and associated vegetated areas informally referred to as Freightliner Wetlands (also called Merritt Wetlands) and Gertz Ditch. The wetland has been altered over the years to accommodate development and portions of the existing wetland are mitigation for impacts. The Bureau of Environmental Services conducted revegetation on multiple properties associated with the wetland. The revegetation projects are now closed and property owners maintain the site.

The vegetation south and east of the wetland is composed mostly of black cottonwood, red alder, and ash. On higher ground, particularly toward the southern portion of the survey site, western red cedar, grand fir, and Douglas-fir are present. Understory shrubs include; Douglas spiraea, red-osier dogwood, willow species. Himalayan blackberry is also present, however mostly in areas with a high edge-to-area ratio (e.g. wind rows, property line plantings). Where present, ground cover is generally a mixture of rushes, bulrushes, moss, and creeping buttercup. English ivy is also present localized patches.

A small interior area of shrubland to the east is comprised mostly of willow, Douglas spiraea, and young alder and cottonwood trees. The understory in this area contains small-fruited bulrush, common rush, moss and/or water, leaf litter or bare ground.

Along Gertz Ditch is a narrow strip of trees. To the north of Gertz Ditch and to the southwest of the wetland the vegetation is generally either mown turf grass, grassy pasture, or fields of reed canary grass.



Freightliner Wetland

Wildlife observed during spring 2009 site visits include: black-capped chickadee, yellow-rumped warbler, mallard, Canada geese, and a tree frog.

Corrections Forested Wetland (CRCI)

Located to the west of the Department of Corrections on NE 33rd, is a forest wetland, a stretch of Elrod Slough and riparian vegetation. The wetland, known as the CRCI Wetland, and riparian area is an active Bureau of Environmental Services revegetation site.

The forested area is composed primarily of black cottonwood, red alder, and Oregon ash, including several large, well established trees. Snowberry and Douglas spiraea are the main understory shrub species along with a small amount of the following weedy species: Himalayan blackberry, English ivy, spurge laurel, and English holly. The eastern edge of the area is primarily red alder with some grand fir.



CRCI Wetland

The interior of this site supports a dense, native shrubland, a somewhat rare occurrence in the slough. Species present include: Nootka rose, swamp rose, red-osier dogwood, Douglas spiraea, tall Oregon grape, and blue and red elderberry. Notably, there are some especially large red-osier dogwood stands on site. Reed canary grass, teasel, and poison hemlock are the most common weed species.

Dry herbaceous areas of the site contain mixed grasses including reed canary grass. Wetter herbaceous areas contain primarily slough sedge, Dewey's sedge, common rush, small-fruited bulrush, and cattail.

During 2009 site visits, wildlife observed included: tree frogs, goldfinch, song sparrow, black-capped chickadee, northern flicker, American crow, brown creeper, red-tail hawk, mallard, wood duck, and cormorant. Deer tracks and coyote scat were also seen.

Elrod Slough

Elrod Slough drains areas north of Broadmoor Golf Course and west and south of Riverside Golf Course. It connects with Subaru Wetlands, Port of Portland mitigation sites, the forested wetland on property owned by the Oregon Department of Corrections and drainageways to the north. The dominant tree species along Elrod Slough are black cottonwood and mixed conifer-hardwood trees. Elrod Slough, as well as Riverside Golf Course, are within the flood area and can provide flood storage during large storm events. Elrod Slough is actively maintained for flow conveyance by the Multnomah County Drainage District. Maintenance includes riparian vegetation removal within 25 feet of the waterway and removal of in-water large structure woody debris. Elrod Slough flows to MCDD pump station #2 where it is pumped into the Slough.



Elrod Slough

Elrod Slough and associated riparian vegetation provide resting, roosting, nesting, foraging and shelter opportunities for birds and mammals. Red-tailed hawk, barn owl, great horned owl, great blue heron, European starling, mallard, Canada goose, gulls, and American crow are known to use Elrod Slough and surrounding vegetation.

A portion of Elrod Slough and surrounding riparian area is located on Portland International Airport property. This area is located between Subaru Wetland to the south and SW Quad to the north.¹ There are small wetlands and riparian vegetation, that in combination with Elrod Slough provide habitat for a

¹ Inventory Site CS2: Portland International Airport provides a natural resource description for SW Quad.

number of wildlife species. The Port also has an upland mitigation site located here - Elrod Slough Mitigation Site. The site includes big-leaf maple, Oregon ash, black cottonwood, Douglas fir, western red cedar, native rose, Pacific ninebark, snowberry, willow and red osier dogwood.

Table 13: Port of Portland Wildlife Species Observations in Elrod Road Mitigation Site 2002-2009		
Birds		
Accipiter, unidentified	Gold-crowned sparrow	Red-shouldered hawk
American crow	Golden eagle	Red-tailed hawk
American goldfinch	Great-blue heron	Red-winged blackbird
American kestrel	Great egret	Ring-necked duck
American pipit	Great horned owl	Ring-necked pheasant
American robin	Green-winged teal	Rock dove
American widgeon	Greater white fronted goose	Rough-legged hawk
Bald eagle	Golden-crowned kinglet	Ruby-crowned kinglet
Band-tailed pigeon	Golden-crowned sparrow	Savannah sparrow
Barn owl	Gull sp.	Say's phoebe
Barn swallow	Hooded merganser	Sharp-shinned hawk
Belted kingfisher	Horned lark (incl. Streaked)	Short-eared owl
Bewick's wren	House finch	Song sparrow
Black phoebe	House sparrow	Spotted towhee
Black-capped chickadee	House wren	Stellar's jay
Black-headed grosbeak	Killdeer	Swainson's hawk
Brewer's blackbird	Lapland longspur	Townsend vole
Brown Creeper	Lazuli bunting	Tree swallow
Brown-headed cowbird	Least sandpiper	Turkey vulture
Bullock's oriole	Lincoln's sparrow	Vaux's swift
Bushtit	Loggerhead shrike	Violet-green swallow
Cackling goose	Long-billed curlew	Warbler, unidentified
Canada goose	Mallard	Western kingbird
Cedar waxwing	Merlin	Western meadowlark
Cliff swallow	Mountain bluebird	Western sandpiper
Common snipe	Mourning dove	Western scrub jay
Common yellowthroat	Northern flicker	Western tanager
Cooper's hawk	Northern harrier	Western wood pewee
Dark-eyed junco	Northern pintail	White-breasted nuthatch
Downy woodpecker	Osprey	White-crowned sparrow
European starling	Peregrine falcon	Wood duck
Falcon, unidentified	Pied-billed grebe	Yellow-headed blackbird
Fox Sparrow	pigeon	Yellow warbler
Gadwall	Purple martin	Yellow-rumped warbler
Gambusia	red-breasted nuthatch	
Mammals		
Beaver	Deer mouse	Nutria
Black-tail deer	Feral cat	Raccoon
Cottontail rabbit	Gray-tailed vole	Squirrel
Coyote	Mole	
Reptiles and Amphibians		
Bullfrog	Long toe salamander	Western painted turtle
Garter snake	Pacific treefrog	
Fish		
*Carp		

*Observed in adjacent open-water habitat

The airport actively manages this area to reduce wildlife strike risks. Management includes bird hazing with noise, physically removing nests, performing egg intervention, reducing surface ponding, and managing vegetation. The Port does not perform these activities within the Elrod Slough drainageway.

Portions of Elrod Slough, the Port Mitigation Site and surrounding wetlands and riparian vegetation are designated Special Habitat Area CS26 because this area provides a wildlife connectivity corridor (C) to other habitats including Subaru Wetland and SW Quad and there are multiple wetlands (W).

Secondary Drainageways and Fazio Fields

Located along NE 33rd Drive, north of Subaru Wetlands, are five secondary drainageways, all hydrologically connected, and open fields, called Fazio Fields, which were formerly agricultural lands. The secondary drainageways currently provide surface water and groundwater conveyance from undeveloped and developed lands.

On the east side of NE 33rd is a composting facility. There are two secondary drainageways, one to the north and one to the south, of the composting facility that flow to the east then south along the eastern boundary of the area known as Fazio Fields. These drainageways then flow west across NE 33rd, connect with Elrod Slough, which flows to MCDD pump station #2 where it is pumped into the Slough. A small strip of large trees, primarily cottonwoods and willows, surround the northernmost drainageway. The understory is comprised of Himalayan blackberry and red-osier dogwood with little to no herbaceous cover. The shrubland on the south bank is largely Himalayan blackberry with a thin strip of grass along the water's edge. Woodland vegetation south of the large parking lot and the northwest corner of the area is mostly cottonwood with some willow, dogwood, and Himalayan blackberry. There are several large standing cottonwood snags that have nest cavities and insect hunting holes. During a spring 2009 site visit, many birds were heard but only the red-winged blackbird and house finch were identified.

To the west of NE 33rd, the open fields have been developed; in 2007, Concordia College constructed an Olympic throwing facility. However, two open channels that convey stormwater still exist.

To the east of NE 33rd Drive, the drainages and the surrounding vegetation are owned and managed by the Port of Portland. Within Fazio Fields the two secondary drainageways were likely created to drain the fields when the property was farmed; these drainageways also connect up with the northern drainageways to flow under NE 33rd and into Elrod Slough. Fazio Fields are covered in grass with a large expanse of common rush, a wetland associated plant, and several large patches of Himalayan blackberry. Table 14 is a list of wildlife species identified by Port of Portland staff between 2002 and 2009.

Table 14: Port of Portland Wildlife Species Observations in Fazio Fields east of 33rd Drive - 2002-2009		
Birds		
American crow	Common merganser	Mourning dove
American goldfinch	Common snipe	Northern pintail
American kestrel	Cooper's hawk	Peregrine falcon
American robin	European starling	Red-tailed hawk
American widgeon	Gadwall	Red-winged blackbird
Bald eagle	Great-blue heron	Ring-necked duck
Belted kingfisher	Great egret	Song sparrow
Black-capped chickadee	Great horned owl	Turkey vulture
Bushtit	Hooded merganser	Western kingbird
Canada goose	Mallard	Western meadowlark
Mammals		
Black-tail deer	Coyote	Nutria

Subaru Wetland

Subaru Wetland is a 50-acre juncus/willow wetland and is surrounded by the Broadmoor Golf Course. The wetland dominated by Himalayan blackberry. Red osier dogwood, willow and rushes are also present.

The southern edge of the wetland is delineated by a well-established Cottonwood-Ash Forest, containing an understory of Himalayan blackberry and red-osier dogwood. The northern edge of the wetland has another belt of black cottonwood forest with a red alder understory and a grassy belt that extends to the Elrod Slough bank. A smaller patch of planted woodland exists in the northwest corner of the site and is composed of Douglas-fir, red alder and mixed native shrubs with a grassy understory. Several standing cottonwood snags are scattered throughout.



A more open and younger assemblage of the cottonwood-ash forest with a Himalayan blackberry and red-osier dogwood understory are present along the wetland's eastern edge and along Broadmoor Canal, which flows through the wetland.

Much of the interior is a wooded wetland comprised primarily of willow species and reed canary grass with some slough sedge, nettle, and teasel interspersed. Some Oregon ash is also present, but not in great abundance. A few fairly large patches of yellow flag dominate openings in the northeastern section. A good amount of downed woody debris is also present along with much standing water.

The non-wooded portion of this wetland has a very high water table and is largely covered with reed canary grass with patches of native emergent vegetation including soft rush, tule, and cattail. The northern most portion of the herbaceous region is an active horse pasture, dotted with a few weeping willows and flanked by a blackberry thicket to the east.

The wetland and vegetation provides food, roost, perch and nesting sites for song birds, waterfowl, woodpeckers, raptors and shorebirds. During site visits the following birds were observed: common yellowthroat, song sparrow, robin, mourning dove, Vaux's swift, scrub jay, mallard, bufflehead, varied thrush, savannah sparrows, Virginia rail, and common snipe (1989, 2009). Several deer and nutria and/or beaver trails run across the wet shrubland, and numerous slides have been worn into the banks of Broadmoor Canal, indicating that wildlife is accessing the waterway. Coyote scat was observed in the more open portion of the shrubland. Interspersion with other natural areas is high because Subaru Wetland is located near other small wetlands, drainageways, Peninsula Canal and the Columbia River.

Subaru Wetland collects surface water from surrounding land and drains to the Broadmoor Canal, which flow through the wetland and to Elrod Slough, which is located north and west of the wetland. Subaru Wetland filters sediments and pollutants from surface water; cycles nutrients and contribute to the food web; moderates air and water temperatures; provides a channel migration area for the secondary drainageways; and provides connectivity to other habitats in close proximity to the wetlands including the Columbia Slough main channel.

Subaru Wetland is a designated Special Habitat Area (CS13) because it is a wetland complex (W) surrounded by bottomland hardwood forest (B).



The use of fertilizers and pesticides at Broadmoor Golf Course may have negative impacts to water quality and habitat of the wetland and drainageways. Bird hazing at the golf course may also impact other wildlife using this area. Trash from the parking lots to the west has blown onto the western edge of the survey site, and a seemingly iron-rich seep is flowing onto the site from the diagonal corner of the employee parking lot of the northernmost warehouse.

A smaller wetland is located to the north of Subaru Wetland. The unnamed wetland is forested, primarily with black cottonwood, willow and Oregon ash and also contains areas of herbaceous vegetation and invasive species such as Himalayan blackberry.

Golf Courses

There are three golf courses located in the inventory site: Columbia Edgewater, Riverside and Broadmoor. Golf courses, while highly manicured landscapes, provide some of the largest contiguously vegetated areas within the city.

The Broadmoor Golf Course and Elrod Slough along the Riverside Golf Course, along with other locations in the study area, were recently surveyed by US Fish and Wildlife Services for bat use (2009). Bat species documented using the golf course include Little Brown Myotis (*Myotis lucifugus*), Big Brown Bat (*Eptesicus fuscus*), Silver-haired Bat (*Lasionycteris noctivagans*), and Hoary Bat (*Lasiurus cinereus*). The bats utilize water bodies for drinking and foraging and the trees for roosting, both day and night. The first two species, Little Brown and Big Brown, can roost in varying structures from buildings to snags. Silver-haired Bat uses tree crevices and snags. Hoary Bat roosts in tree foliage. Silver-haired and Hoary are migratory and migrate through the study area in the summer. The complex of habitat features at Broadmoor Golf Course (Middle Slough, Buffalo Slough, Subaru Wetland, Broadmoor Canal and riparian tree canopy) and at Riverside Golf Course (Elrod Slough, wetlands and riparian trees) provide habitat for bats. Columbia Edgewater Country Club was surveyed for bat use by Perkins in 2003 and found the same four species plus Long-legged Myotis (*Myotis volans*). Based on the available information, it is reasonable to expect that bats use riparian trees for roosting and open water bodies for foraging and drinking on all three golf courses.

Golf courses, particularly riparian corridors with tree canopy, are utilized by a high concentration and diversity of migratory birds as they travel along the Pacific Flyway, Columbia River, and Columbia Slough Corridor. Willow Flycatchers (an *at risk* species) have been documented by city staff along the Columbia Slough on the east side of Broadmoor and it is likely that they are nesting in riparian habitats throughout the three golf courses. It is likely that the trees located throughout the golf courses are also used by a high concentration of migratory birds. All three golf courses are located between the Columbia River and Columbia Slough. The golf courses are also located on the historic Columbia River floodplain adjacent to the confluence with the Willamette River, a stopover on the Pacific Flyway. Columbia Edgewater is located with 300 feet of the river, while the others are roughly 1 mile of the river.

Columbia Edgewater (CS25), Riverside (CS27) and Broadmoor (CS28) golf courses are designated as Special Habitat Areas because they provide migratory stopover habitat (M); Riverside and Broadmoor are also designated SHA because they provide habitat for at risk bat species (S).

Natural Resource Evaluation

The natural resources located within this site have been evaluated for relative riparian and wildlife habitat quality. Relative quality is presented in the form of relative functional value ranks for riparian corridors, wildlife habitat, and riparian/wildlife habitat value combined (Table 15). The relative ranks are produced using GIS models and information on Special Habitat Areas. The model criteria are not sensitive to the species of vegetation present or whether vegetation is native or non-native. However, the model criteria do assign different riparian functional values to cultivated, heavily manicured and managed landscapes and semi-natural and natural vegetation. The approach used to generate the relative ranks is summarized in the introduction to the inventory sites. Additional detail is provided in the Methodology Overview section of this report and the *Natural Resource Inventory Update: Riparian Corridors and Wildlife Habitat* (City of Portland, 2008).

All of the ranked resource areas provide at least some important riparian and habitat value, recognizing that current condition and function levels may vary considerably. The relative ranks can inform planning programs, design of development or redevelopment projects, mitigation and restoration activities.

Riparian Areas

The site contains portions of the Columbia River and Columbia Slough, vegetated and non-vegetated flood area, riparian forest with associated shrub and groundcover, as well as other types of vegetation that contribute to the riparian functions as detailed in the natural resource description. These landscape features provide the following riparian functions:

- Microclimate and shade
- Stream flow moderation and water storage
- Bank stability, and sediment, pollution and nutrient control
- Large wood and channel dynamics
- Organic inputs, food web and nutrient cycling
- Riparian wildlife movement corridor

High relative functional ranks are assigned to the Columbia Slough, Whitaker Slough, the wetlands, and secondary drainageways. Riparian forests and areas of dense tree canopy receive a high or medium relative ranks depending on proximity to open water. Medium and low relative ranks are generally assigned to lower structure riparian vegetation associated with the slough, drainageways and wetlands. Other resource areas are assigned a high, medium or low relative rank depending on the proximity and extent of vegetation relative to the water body (CS1 Map 4).

Wildlife Habitat

A wildlife habitat patch is, for purposes of the inventory model, defined as forest and/or wetland areas, 2 acres in size or greater, plus adjacent woodland vegetation (note Special Habitat Areas may be smaller and may contain different types of vegetation or other resource features).

The site contains vegetated forested patches, wetlands and corridors that provide wildlife habitat and connectivity between habitat patches. Forested areas and wetlands provide nesting, breeding and foraging habitats for a diverse range of bird and mammal species, as well as amphibians, reptiles, and invertebrate species.

Based on the wildlife habitat model criteria, a medium relative ranking is assigned to forested areas along the Columbia Slough and Whitaker Slough and to wetlands and associated forest vegetation, reflecting patch size, interior area and proximity to water and other patches.

Special Habitat Areas (SHA) descriptions

SHAs contain unique features and provide critical wildlife habitat as described in the Natural Resources Description section above. SHAs receive a high relative rank for wildlife habitat. The SHA ranking supersedes lower rankings generated by the GIS model. Therefore, all SHAs within the site rank high for wildlife habitat (CS1 Map 5).

There are ten SHAs located in site CS1:

- *CS11: Blue Heron Meadows Wetlands* –wetland (W); bottomland hardwood forest (B); and migratory stopover habitat (M)
- *CS12: Peninsula Drainage Canal* – migratory stopover habitat (M); wildlife connectivity corridor (C); area vital to at risk species including Western painted turtles (S)
- *CS13: Subaru Wetlands* – wetland (W); bottomland hardwood forest (B).
- *CS14: Buffalo Slough* – wildlife connectivity corridor (C); resources or structure that provides unique habitat function in natural or built environment because it is an active groundwater upwelling area (U).
- *CS15: Buffalo Street Mitigation Site* – migratory stopover habitat (M); and wildlife connectivity corridor (C)
- *CS25: Columbia Edgewater Country Club* – migratory stopover habitat (M)
- *CS26: Elrod Slough Complex* – wildlife connectivity corridor (C) and wetland (W)
- *CS27: Riverside Golf Course* - area vital to at risk bat species (S); migratory stopover habitat (M)
- *CS28: Broadmoor Golf Course* - area vital to at risk bat species (S); migratory stopover habitat (M)
- *CS30: Middle Slough* – area vital to at risk species including Western painted turtle and Northern red-legged frog (S); migratory stopover habitat (M); and wildlife connectivity corridor (C)

Combined Relative Riparian/Wildlife Habitat Ranking

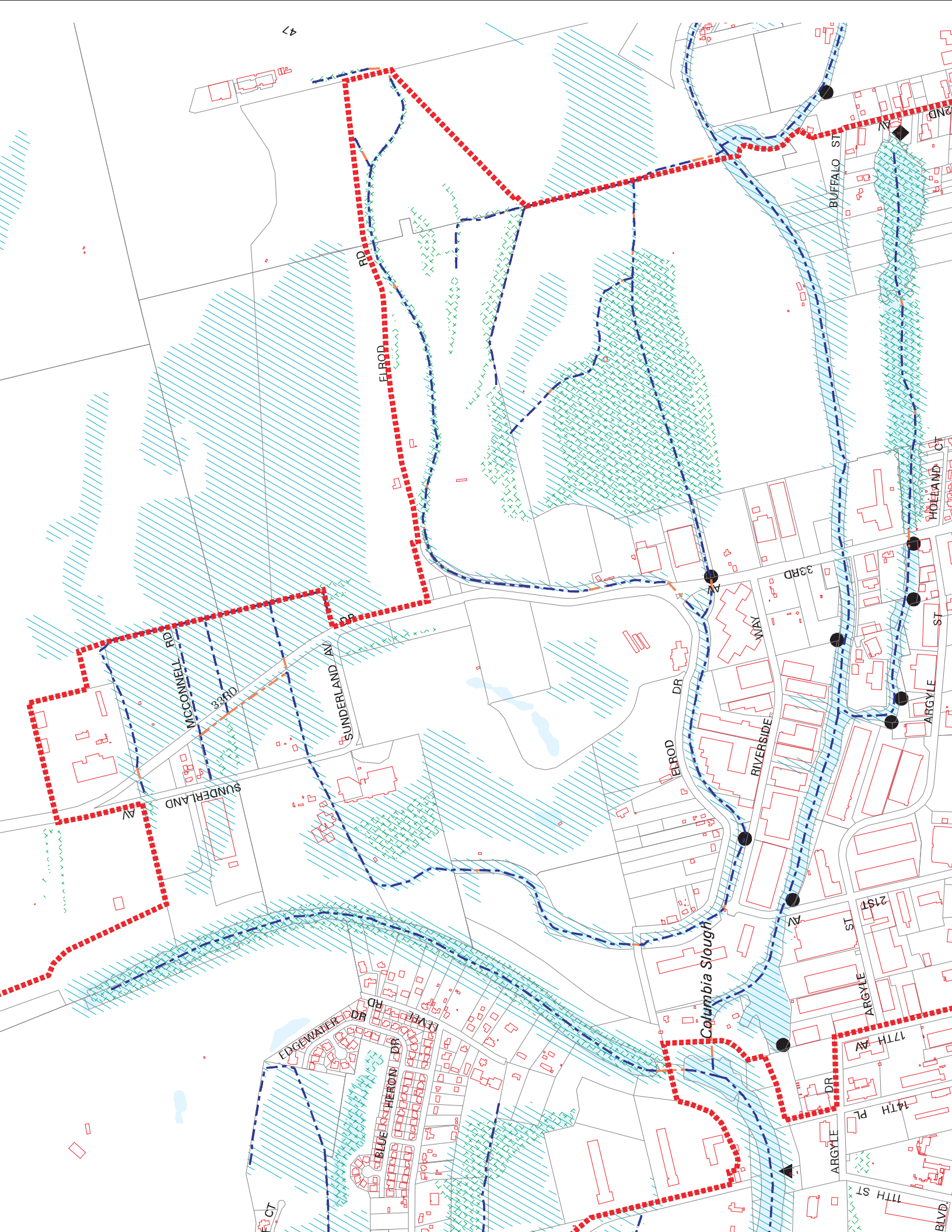
Where areas that are mapped as riparian corridors and wildlife habitat overlap, and their relative ranks differ, the combined relative rank will be the higher of the two ranks. For example, an area that ranks medium for riparian function and low for wildlife habitat will receive a medium combined relative rank (CS1 Map 6).

Table 15: Summary of Ranked Resources in CS1: Buffalo Slough/Peninsula Canal

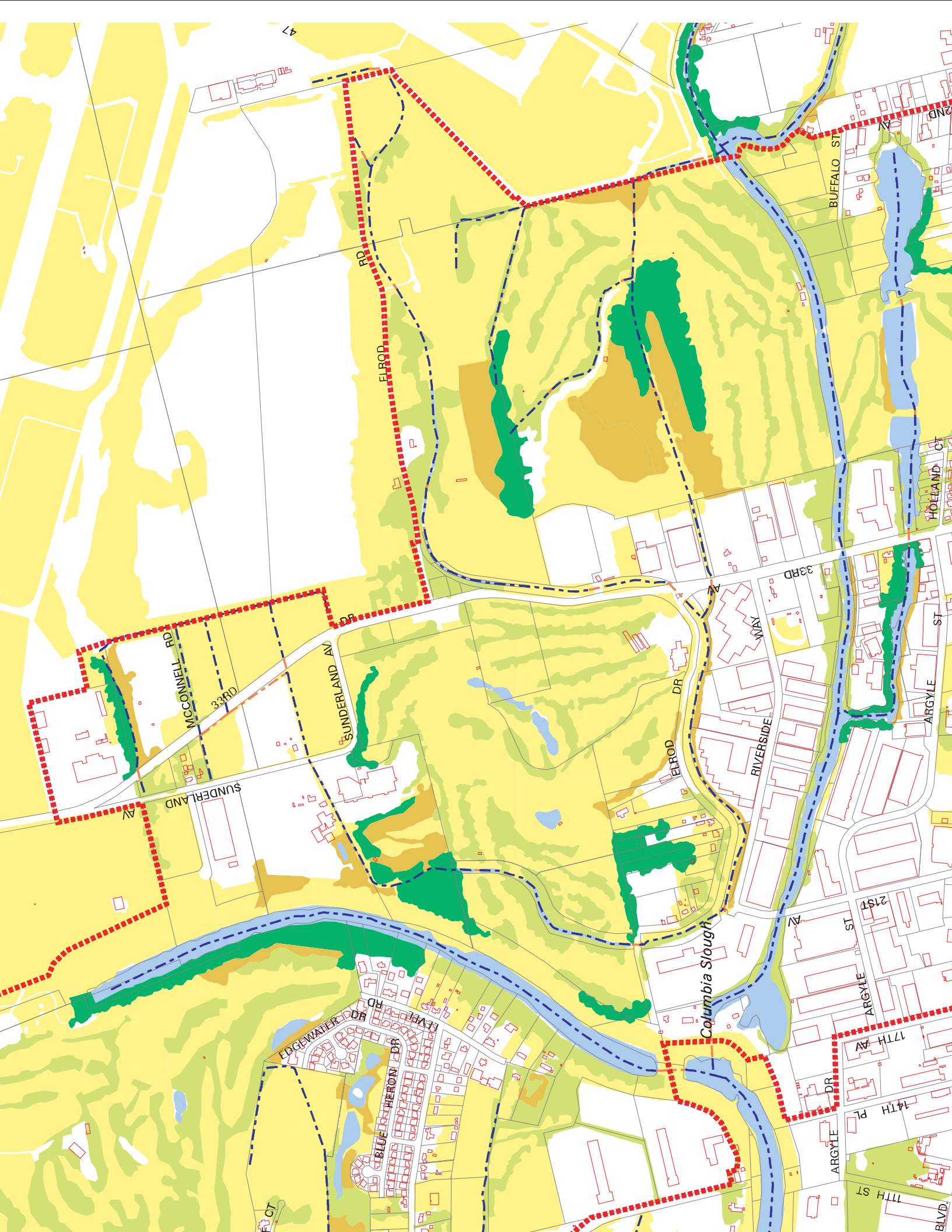
Total Inventory Site = 1,287 acres				
	High	Medium	Low	Total
Riparian Resources*				
acres	233	178	237	647
percent total inventory site area	18	14	18	50
159W5.9 Wildlife Habitat				
Wildlife Habitat*				
acres	0	155	5	160
percent total inventory site area	0	12	<1	13
Special Habitat Areas**				
acres	696			
percent total inventory site area	54			
Wildlife Habitat - adjusted by Special Habitat Areas ***				
acres	696	13	<1	709
percent total inventory site area	54	1	<1	55
Combined Total***				
acres	727	77	78	882
percent total inventory site area	57	6	6	69
*High-ranked riparian resources, Special Habitat Areas, and wildlife habitat includes the Willamette River				
** Special Habitat Areas rank high for wildlife habitat				
*** Because riparian resources, Special Habitat Areas, and wildlife habitat overlap, the results cannot be added together to determine the combined results.				



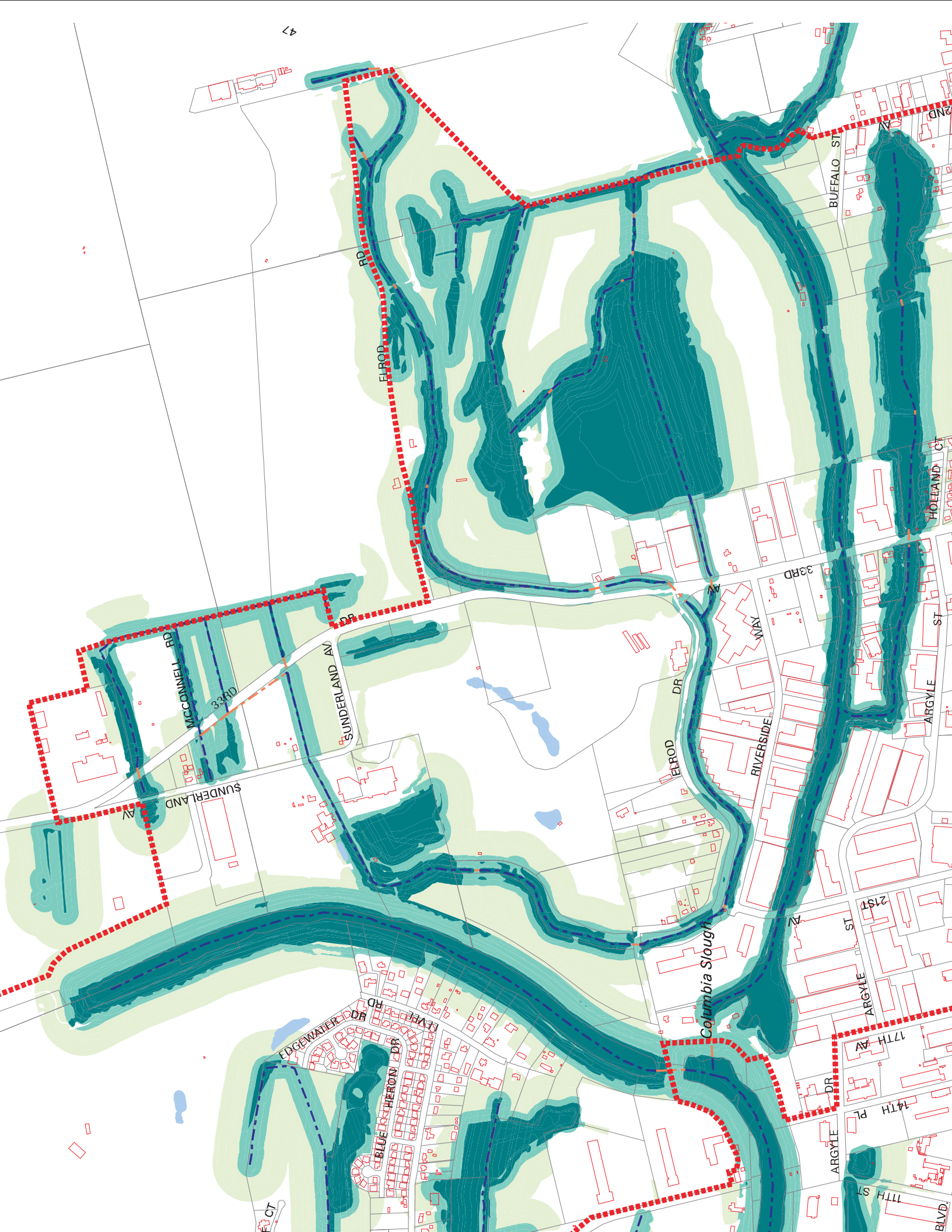
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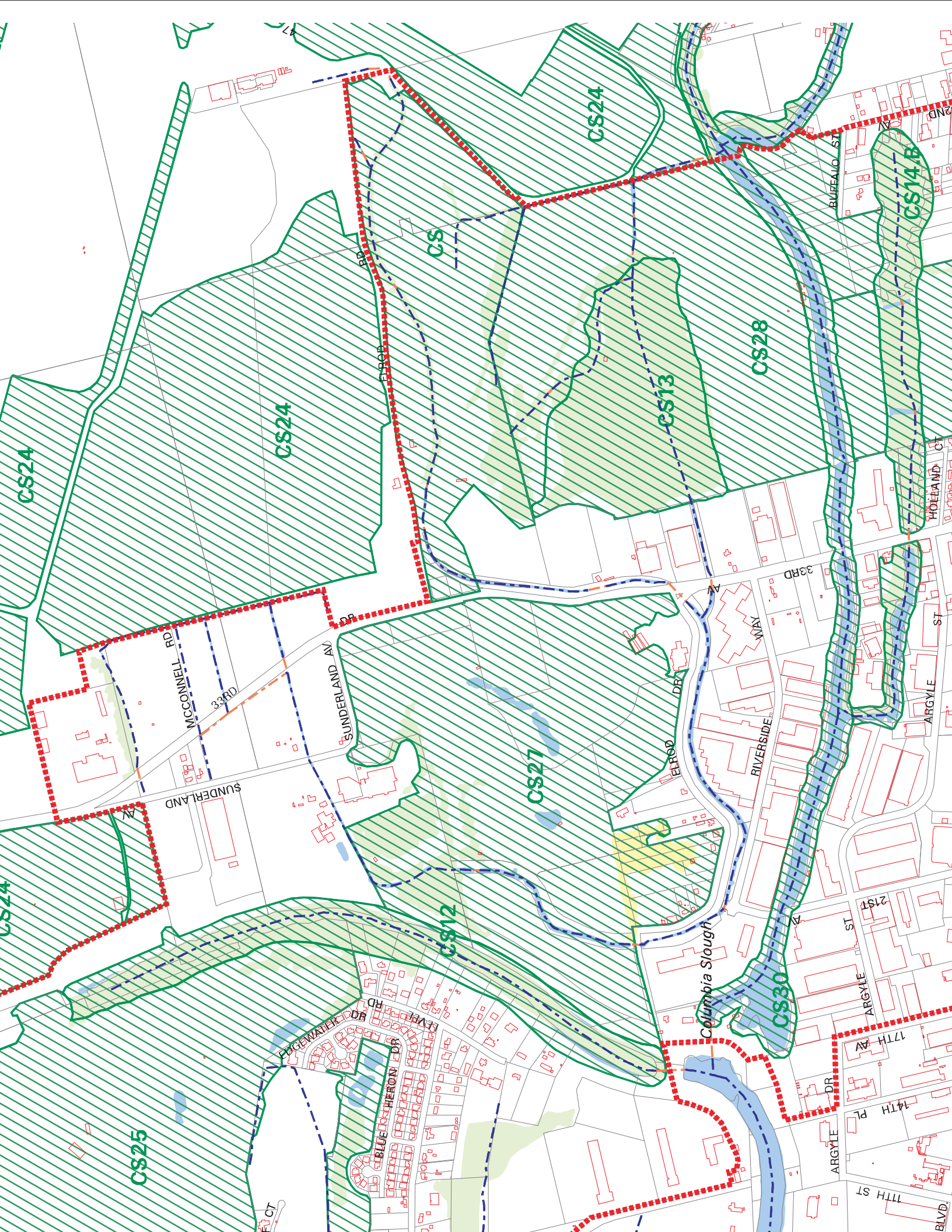
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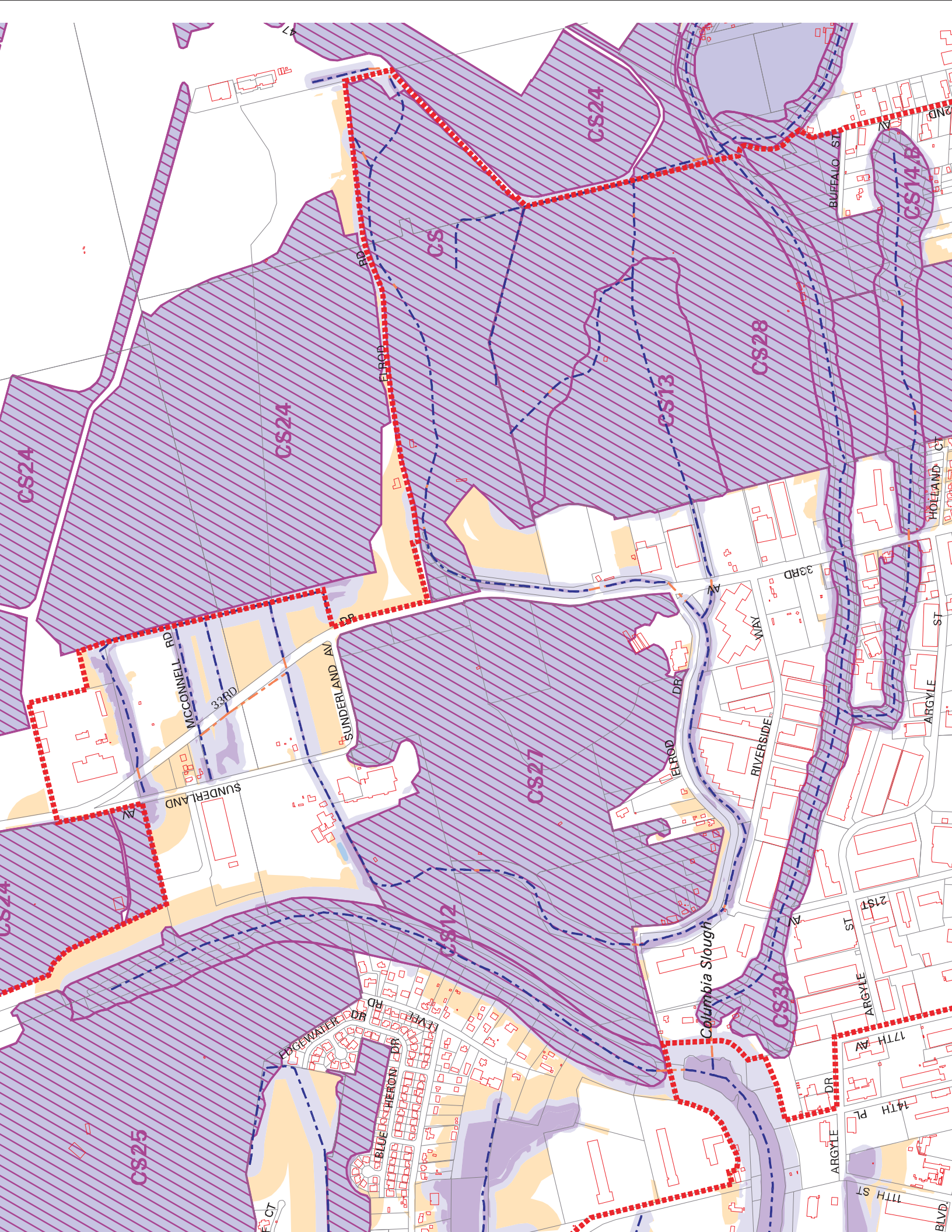
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